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NESTING SEASONS OF WESTERN AUSTRALIAN BIRDS

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I have kept detailed records of my discoveries of birds' nests in Western Australia since 1926 and have recently analysed the data to demonstrate the differences in the nesting seasons in the various districts in which I have made the observations. As bird observing has been very much a spare-time activity, the data are naturally not as perfect as they might be for frequency analysis, but nevertheless they bring out fairly clearly the periodicity which characterises the South-west, the outer Wheatbelt and parts of the North-west.

Marine birds are not considered, and I have excluded any markedly colonial species which would introduce a serious bias in the frequency tables in view of the relatively fewer number of nests of the other species which are dealt with.

In 1926 and 1927, the observations were mainly carried out at Parkerville, in the Darling Range, with some data included from neighbouring localities and a few from the metropolitan area as well. Between 1928 and 1932 observations were based on Lake Grace, in the Wheatbelt. Between 1934 and 1938 I lived in the North-west, after which war duties and other activities compelled a discontinuance of the detailed records which I formerly kept, except for 1943, when I was stationed at Exmouth Gulf with the A.I.F.

Table I gives the frequencies of nests, containing eggs, which were found, arranged in class intervals of half-months. Thus, August I represents the first half of August and August II the second half, and so on.

The individual nesting records for each district and year are too voluminous to reproduce in full, but Tables II, III, IV and V give details of representative years in the Parkerville, Lake Grace and North-west districts. In each table the nest discoveries for the particular season are set out in chronological order, the species being listed successively as found. Thus one may tell at a glance the order in which the species were found nesting, and the "spread" of the egg-laying. Vernacular names only are given, those in Serventy and Whittell's *Handbook of the Birds of Western Australia* being adopted, to which work the reader is referred for the scientific nomenclature.



Fig. 1.—Locality map with some isohyets. The observing stations mentioned in the text are encircled. Scale about 165 miles to the inch.

PARKERVILLE

This district (Lat. 32°S.), 17 miles east of Perth, is representative of the heavily timbered jarrah forest belt of South-western Australia, with its very dependable climate of winter rains and dry summers. Nesting takes place regularly each year in the spring and early summer, with virtually no "out of season" breeding. Egg laying usually begins in early August and attains a peak in late September and early October, tailing off rapidly in December.

LAKE GRACE

Lake Grace (Lat. 33°S.), in the south-eastern Wheatbelt, 170 miles south-east of Perth, has in general a nesting regime similar to that in the wetter portions of the South-west. The peak of egg-laying is approximately the same but the start is earlier and it may continue later. With out of season rainfall, it is conceivable that over a long period of years an observer might build up nesting records for every month of the year. Fairly regular seasons were experienced during my years of observing at Lake Grace (1928 to 1932), excepting that 1930 was an unusually wet year. It will be recalled that it was in this particular year that Mrs. B. E. Cannon first recorded the nesting of Banded Stilts on the salt lake there.

THE NORTH-WEST

Nesting seasons in the North-west of Western Australia are closely dependent on the rainfall and the various species differ in the speed of their response to it. The main categories in which the nesting behaviour can be divided have already been given by me (*Western Australian Bird Notes*, 4, 1948, pp. 8-9). The main nesting takes place, in ordinary seasons, in the winter and spring but irregular rains, such as may accompany thunder-storms or cyclones, will induce nesting among certain species outside of these times, and nesting may occur at any time of the year. Local thunderstorms may permit breeding in very circumscribed areas and yet only a mile or so away there will be nothing.

— 1934 —

The year 1934 was a very favourable one throughout the North-west. At Landor Station (formerly Upper Clifton Downs, Lat. 25°S.), on the Gascoyne River 200 miles easterly of Carnarvon, there were good falls of rain at the end of March and in April, and conditions were perfect for nesting during the period I spent there — from early April until the end of August. Nesting began soon after my arrival and the first nest was found on April 7. As breeding was still in full swing when I left, the frequency data in Table I are incomplete. However, two peaks of egg laying stand out clearly. The earlier group consists of birds which nest immediately after rain, the latter those which breed in the late winter and spring when conditions are favourable.

It will be noted that in certain species some individuals nested early in the season while others had eggs only in the latter

part, with no records of layings in between. These species included the Magpie Lark, Crested Bell-bird, Yellow-throated Miner (the earlier nesting group had almost all a clutch of 3 eggs while in the latter were a greater proportion of 4-egg clutches), Red-throat, Black-faced Cuckoo-Shrike, Grey-crowned Babbler, Singing Honeyeater, Ground Cuckoo-Shrike, Tree-Martin, Zebra Finch and Little Crow.

— 1935 —

This was a year of severe drought in the area in which I worked — Carnarvon to about 250 miles inland. I was in the field from April 24 to September 27 and throughout that period found only six nests. These were: White-plumed Honeyeater (April 24, September 22), Zebra Finch (April 28), Diamond Dove (April 30), Little Quail (May 8) and Wedge-tailed Eagle (June 12).

— 1937 —

Good rains accompanied cyclones and thunderstorms between January and April and the season was a good one at my Ilbrenia Station (Lat. 24°S.), at the junction of the Ashburton River and Tunnel Creek (some 150 miles north of Peak Hill), where I operated this year. Nesting started in January and probably ran the same course as it did on Landor in 1934, but I had to leave the north early in April and have no records of its progress after that date.

— 1938 —

From May to the end of the year I was in the same general area as in 1937 — in the country between the Gascoyne and Ashburton Rivers where their courses approach each other so that they are barely sixty miles apart (the so-called Ashburton Divide), on Ilbrenia, Mulgul and Milgun Stations (Lat. 25°S.), and I also spent some time on Turee Station (Lat. 24°S.), north of the Ashburton. It was a fairly dry season on the whole but in June-July good rain fell at Turner's Creek (a tributary of the Gascoyne), resulting in favourable conditions in a very restricted area. In this "thunderstorm patch", about one mile in width by about four miles in length, there was lush vegetation with a carpet of everlasting knee-deep compared with the 1-6 inch growth elsewhere, where only light rain fell. The first nest was found on July 28 and I only found three nests until I went to the Turner Creek "oasis" on August 18. I stayed here until September 7 and recorded no less than 32 nests with eggs. On my return to the light rainfall country I found only 16 nests between September 8 and October 16 — the date of the last nest found. In this drier area, at Mulgul Station a nest of the Black-throated Butcher-bird was found which contained only one egg, which was its full clutch (the average is 3-4 eggs).

— 1943 —

I was stationed with the A.I.F. near the Learmonth Airfield ("Potshot") at Exmouth Gulf (Lat. 22°S.) from the first week in

January until late in October, and had one day a week available for bird observing. During this period I obtained records of 107 nests with eggs but many species bred on which I was not able to obtain precise data, and visits to some important areas were banned in May and June because of unfounded reports that Japanese had landed.

It was a good season. The weather was very hot constantly. About February 12 a cyclone worked up and brought high winds and several inches of rain. This lasted over a week. About three months later there were further good rains. Vegetation flourished; Sturt Peas grew to knee-height and annuals were up to four feet. Birds started to breed in February and nesting was still in full progress when I left in October. There was, however, a gap in the nesting between mid-April and early August. The records as given in Tables 1 and 5, however, unduly emphasise the distinctness of this gap. The absence of records during this period is only partly due to a real diminution of nesting activity but also to the fact that I was not able to engage in field work during much of the time. Thus the general situation in 1943 really much more nearly resembled that of 1934 than the actual figures indicate.

TABLE I — NEST FREQUENCIES

	Parkerville		Lake Grace					North-west				
	1926	1927	1928	1929	1930	1931	1932	1934	1935	1937	1938	1943
Jan. I	0	0	0	0	0	0	0	—	—	0	—	0
Jan. II	0	0	0	0	0	0	0	—	—	9	—	0
Feb. I	0	0	0	0	0	0	0	—	—	6	—	0
Feb. II	0	0	0	0	0	0	0	—	—	8	—	5
Mar. I	0	0	0	0	0	0	0	—	—	5	—	22
Mar. II	0	0	0	0	0	0	0	—	—	4	—	23
Apr. I	0	0	0	0	0	0	0	31	—	—	—	5
Apr. II	0	0	0	0	0	0	0	41	3	—	—	0
May I	0	0	0	0	0	0	0	5	1	—	—	0
May II	0	0	0	0	2	1	0	13	0	—	0	0
June I	0	0	0	0	0	0	0	6	1	—	0	0
June II	0	0	0	0	1	2	0	8	0	—	0	0
July I	0	0	0	0	1	1	0	6	0	—	0	—
July II	0	0	9	5	2	3	1	3	0	—	1	0
Aug. I	0	3	7	0	5	4	3	37	0	—	2	6
Aug. II	11	13	15	4	10	4	6	40	0	—	16	12
Sept. I	9	17	25	22	20	6	8	—	0	—	20	18
Sept. II	21	8	23	18	12	12	8	—	1	—	3	5
Oct. I	5	16	—	12	32	6	5	—	—	—	7	4
Oct. II	5	7	1	22	16	5	—	—	—	—	1	6
Nov. I	6	5	6	7	7	—	3	—	—	—	0	—
Nov. II	5	0	6	2	8	—	1	—	—	—	0	—
Dec. I	4	0	3	0	1	—	0	—	—	—	0	—
Dec. II	2	0	2	0	0	—	2	—	—	—	0	—
Jan. I	1	0	2	0	0	—	0	—	—	—	0	—

TABLE 2 — NESTING RECORDS FROM PARKERVILLE, 1927.

Yellow-tailed Thornbill	Aug. 10, 16, 25; Sept. 1; Oct. 25; Nov. 15.
Western Spinebill	Aug. 14, 27; Sept. 10.
Scarlet Robin	Aug. 14, 18; Sept. 1, 18.
Little Wattle-bird	Aug. 19, 21, 21, 25; Sept. 1, 12, 12; Oct. 3.
Raven	Aug. 23.
White-browed Babbler	Aug. 23. (at the 43-mile peg, York Road)
Western Silver-eye	Aug. 29; Nov. 13.
Western Magpie	Aug. 29; Sept. 1, 9, 12, 12, 24, 31; Oct. 3.
Red Wattle-bird	Aug. 30; Sept. 6, 6.
Tawny Frogmouth	Sept. 6, 24.
White-faced Heron	Sept. 7 (York).
Yellow Robin	Sept. 9, 19.
White-naped Honeyeater	Sept. 14.
Pallid Cuckoo	Sept. 14, 19.
Western Thornbill	Sept. 30; Nov. 6.
Australian Plplit	Oct. 4.
Black-eapped Sittella	Oct. 7, 12.
Kookaburra	Oct. 9.
Banded Blue Wren	Oct. 13, 17; Nov. 6, 18.
Squeaker	Oct. 17.
Western Warbler	Oct. 20; Nov. 5, 20.
Brown Hawk	Oct. 22.
Rufous Whistler	Oct. 30 (Perth).
Red-tipped Diamond-bird	Nov. 5.
Golden Whistler	Nov. 5.
Sacred Kingfisher	Nov. 7, 20.
Black-faced Cuckoo-Shrike	Nov. 28.

TABLE 3 — NESTING RECORDS FROM LAKE GRACE, 1930.

Banded Plover	May 17, 19; June 27; Sept. 17.
Striated Field-Wren	July 6; Sept. 13.
Wedge-tailed Eagle	July 20.
Tawny-crowned Honeyeater	July 26; Aug. 3.
Red Wattle-bird	Aug. 3; Oct. 5.
Australian Plplit	Aug. 6, 11; Sept. 3, 5, 6; Oct. 22.
Squeaker	Aug. 10.
White-tailed Black Cockatoo	Aug. 17; Sept. 14, 20.
Mountain Duck	Aug. 22, 31.
Hoary-headed Grebe	Aug. 27, 27, 27, 27; Sept. 7, 10, 13, 13; Oct. 7, 12, 12, 12, 12.
White-fronted Chat	Aug. 20; Oct. 17.
Grey Teal	Aug. 30; Sept. 3; Oct. 14.
Musk Duck	Aug. 31; Sept. 13, 13, 16; Oct. 12; Nov. 16.
White-faced Heron	Sept. 3; Oct. 5.
Tawny Frogmouth	Sept. 4, 6.
Common Bronzewing	Sept. 7; Oct. 23.
Pallid Cuckoo	Sept. 7.
Western Rosella	Sept. 10, 13, 14, 27.
Twenty-eight Parrot	Sept. 13, 18.
Willy Wagtail	Sept. 16.
Hooded Robin	Sept. 17.
Chestnut Teal	Sept. 19.
Stubble Quail	Sept. 21; Oct. 8, 18, 20.
Smoker Parrot	Sept. 30, 30.
Brown Honeyeater	Sept. 30.
Boobook Owl	Oct. 3.
Australian Goshawk	Oct. 3.
Dusky Wood-Swallow	Oct. 5.
Red-capped Dotterel	Oct. 7, 8, 8, 11, 11, 12, 15, 19, 19, 19, 22, 22, 22; Nov. 9, 9, 9, 9, 23, 23.
White-headed Stilt	Oct. 7, 7, 8, 8, 8, 12, 14, 22.
Hooded Dotterel	Oct. 11, 11, 22.

Black Swan	Oct. 11.
Spotted Harrier	Oct. 23.
Red-tipped Diamond-bird	Oct. 29; Nov. 16.
Kestrel	Oct. 29; Nov. 3.
Brown Flycatcher	Nov. 1.
Grey Fantail	Nov. 9.
Bee-eater	Nov. 16, 16.
Western Silver-eye	Nov. 23.
Purple-crowned Lorikeet	Nov. 23.
White-fronted Heron	Dec. 12.

TABLE 4 — NESTING RECORDS FROM LANDOR STATION, 1934

Magpie Lark	April 7, 7, 7; Aug. 11, 23.
Crested Pigeon	April 7, 8, 9.
Crimson Chat	April 7.
Crested Bell-bird	April 8, 17, 23; Aug. 19.
Yellow-throated Miner	April, 8, 8, 9, 9, 9, 9, 11, 11, 11, 11, 13, 13, 14, 14, 14, 27; Aug. 3, 10, 18, 21, 22.
White-plumed Honeyeater	April 11; Aug. 21; Sept. 30.
Brown Song-Lark	April 11.
Australlan Pipit	April 11, 24, 24.
Redthroat	April 13, 19, 22; Aug. 18.
Blue-and-white Wren	April 13, 14.
Black-faced Cuckoo-Shrike	April 14; Aug. 15.
Varlegated Wren	April 14, 19, 19, 24, 26, 30; May 3.
Grey-crowned Babbler	April 16; Aug. 11.
Whiteface	April 17, 21, 26; May 11, 22.
Black-faced Wood-Swallow	April 17, 19, 21, 21, 24.
Banded Blue Wren	April 17, 24, 24.
Western Shrike-Thrush	April 18.
White-browed Tree-creeper	April 19, 28.
Singing Honeyeater	April 20, 24; Aug. 7.
Hooded Robin	April 21.
Black-capped Sittella	April 23.
Zebra Finch	April 24, 30; May 20, 24, 25, 26; July 15, 20; Aug. 2.
Wedgebill	April 24.
Banded Whiteface	April 24, 25, 25, 27, 29; May 22; June 25; Aug. 8.
Rufous Whistler	April 24.
White-faced Heron	May 3.
Robust-billed Thornbill	May 11.
Ground Cuckoo-Shrike	May 17; Aug. 7, 19.
Willy Wagtail	May 22, 24.
Emu	May 22; June 14.
Tree-Martin	May 24; Aug. 10.
Little Crow	May 24; Aug. 11, 22.
Whistling Eagle	May 29; June 18.
Little Pled Cormorant	June 11.
Yellow-tailed Thornbill	June 12; July 15; Aug. 21, 21.
Little Black Cormorant	June 12, 12, 12.
Budgerygah	June 21, 21, 22, 26, 28; July 11; Aug. 2, 3, 3.
Brown Thornbill	July 5.
Little Eagle	July 9.
Grey Teal	July 10.
Chestnut-tailed Thornhill	July 19.
Galah	July 20; Aug. 1, 12, 12, 12, 13, 13, 13, 15, 15, 19, 20, 20, 23.
Kestrel	Aug. 3, 9, 11, 12, 17, 21, 23, 23, 23, 24, 26.
Brown Hawk	Aug. 3, 9, 23.
Tawny Frogmouth	Aug. 4, 7, 7.
Red-capped Robin	Aug. 6, 8.
Grey Butcher-bird	Aug. 7.

Cinnamon Quail-Thrush	Aug. 7, 29.
Pied Butcher-bird	Aug. 11, 28.
Owlet Nightjar	Aug. 12, 24.
Mulga Parrot	Aug. 17.
Twenty-eight (Ringnecked) Parrot	Aug. 14, 21.
Black-backed Magpie	Aug. 15, 18.
Little Corella	Aug. 20, 20, 21, 23, 23.
Spotted Harrier	Aug. 26.
Little Falcon	Aug. 26.
Bee-eater	Oct. 22.

TABLE 5 — NESTING RECORDS FROM EXMOUTH GULF, 1943.

Diamond Dove	Feb. 19, 26; March 28; Aug. 31; Sept. 11, 11.
Slnglng Honeyeater	Feb. 26, 27; March 8, 11, 11, 19, 28; Aug. 15, 24.
Varlegated Wren	Feb. 27; March 9, 10, 12, 14, 24.
Crested Pigeon	March 8, 14, 14, 28.
Black-faced Cuckoo-Shrike	March 8, 16, 22, 24; Sept. 1.
Wedgchlli	March 8, 9, 10, 11, 11, 16, 19, 28.
Black-faced Wood-Swallow	March 8, 14, 28; Oct. 23.
Blue-and-white Wren	March 10.
Little Quail	March 11, 12; April 11.
Narrow-billed Bronze Cuckoo ..	March 12.
Crested Bell-bird	March 14, 16, 16, 17, 19, 23, 24.
White-plumed Honeyeater	March 16; Sept. 1, 9, 22.
Western Shrike-Thrush	March 18, 24; April 5.
Grey-headed Honeyeater	March 21; Aug. 8, 22, 22, 24; Sept. 26, 26.
Zebra Finch	March 30; April 2; Sept. 11, 11.
Budgerygah	April 2.
Hooded Robin	April 4.
Wedge-tailed Eagle	July 4.
Twenty-eight (Ringnecked) Parrot	Aug. 8, 8.
Galah	Aug. 8, 15.
Spiny-cheeked Honeyeater	Aug. 15; Oct. 5.
Pied Oyster-catcher	Aug. 22; Sept. 4.
Brown Hawk	Aug. 25, 31.
Crow	Aug. 28; Sept. 14; Oct. 6.
White-winged Triller	Aug. 31; Sept. 4.
Red-browed Diamond-bird	Sept. 4, 6, 6, 11, 11; Oct. 17, 17.
Little Eagle	Sept. 11.
Crimson Chat	Sept. 11.
Australian Bee-eater	Sept. 11, 26.
Kestrel	Sept. 20; Oct. 12.
Red-backed Kingfisher	Oct. 14, 17, 17, 23.

TWO NEW SPECIES OF BURROWING FROGS OF THE GENUS *HELIOPORUS* GRAY FROM SOUTH-WESTERN AUSTRALIA

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In the course of an ecological survey of the genus *Helioporus* Gray two apparently unnamed frogs have been found. A review of the literature indicates that the two may have been confused with *H. eyrei* and *H. albopunctatus* through morphological similarity. However, constant behavioural, reproductive and ecological